Operating and Service Manual

GOULD

An Electrical/Electronics Company

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An Electrical/Electronics Company

MANUAL PART NO.
15-803307-XXU

GOULD 3052, 3054 & 3056
X-Y RECORDER
ALL MODELS
OPERATOR'S MANUAL

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SECTION I

GENERAL INFORMATION

1.1 SCOPE OF MANUAL

This manual contains operating, installation and operator-performed maintenance instructions for the Gould 305X X-Y Recorder. Descriptive details and specifications are also included, as is information on options, supplies and accessories available for the 305X Recorder. For service/ repair information, including parts lists, schematics, theory of operation, calibration, etc. see the companion "SERVICE MANUAL", part number 15-803307-XXS or contact your local Gould representative.

1.2 DESCRIPTION

1.2.1 General Description

The Gould 3054 X-Y Recorder (Figure 1-1) is typical of the 305X recorder line. It is an extremely versatile and reliable general-purpose / laboratory instrument, with features normally found only on much more expensive units. It can handle a broad range of industrial, scientific, and biophysical measurement applications that demand precise, permanent records of the relationship between two analog variables.

Quick and easy to setup, the 305X with its silent electrostatic holddown, paper alignment lights, and carriage stand-by features provides for fast and consistent positioning of both 11 x 17 in. and 8-1/2 x 11 in. paper (or their DIN-A3 or A4 equivalents). Innovative pushbutton controls, including an input polarity reversal, add to the unit's ease of operation.

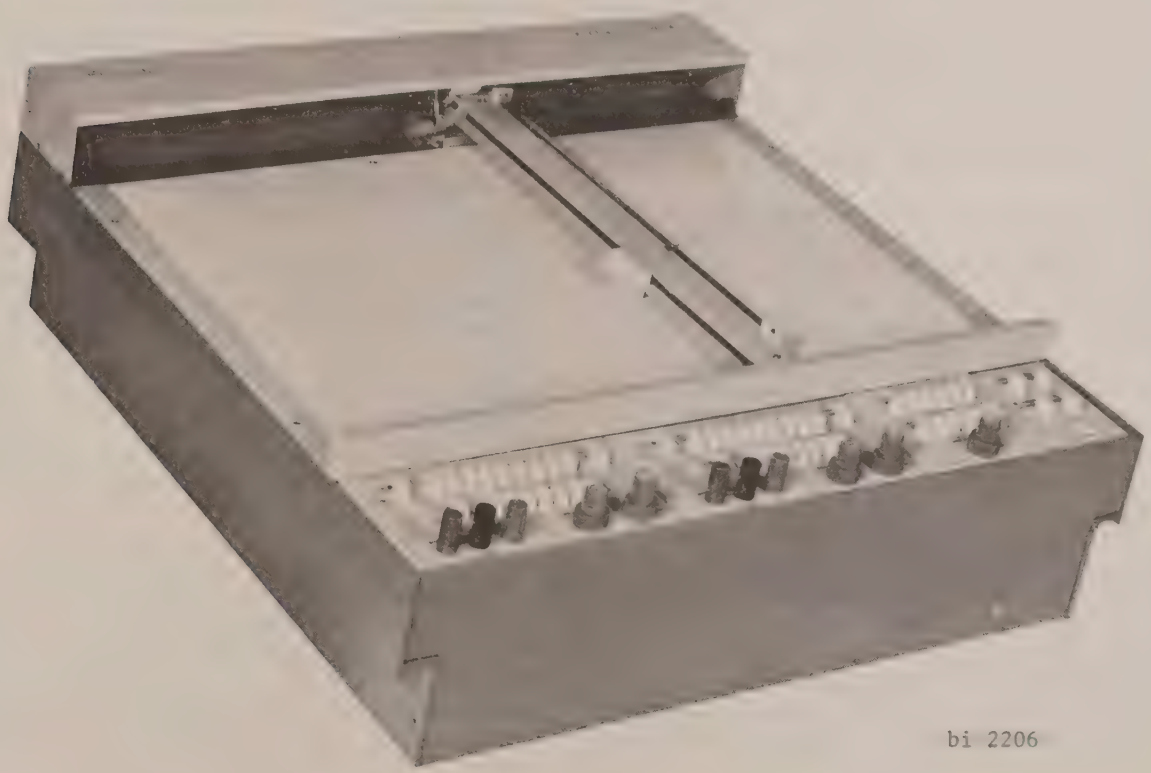


FIGURE 1-1 GOULD 3054 X-Y RECORDER

An optional timebase module for the recorder can be made an integral part of the unit. It provides six timed ramp voltages causing sweeps of 0.25, 0.5, 2.5, 5, 25 or 50 s/cm (0.5, 1.0, 5, 10, 50, 100 s/in.) which can be applied to either axis to produce X-T or Y-T plots. The timebase module provides automatic reset at the end of a scan and also has a unique scan width control feature to accommodate the size of chart used or the amount of the chart that the user wishes to cover. Provision for remote control of the start and reset functions is also provided.

Table 1-1 lists and describes the standard models available.

A Time Base Retrofit kit may be purchased separately and installed by the user. The Retrofit model number 893227-1 (English) or -2 (Metric).

This recorder is rack-mountable. The required hardware is included with each unit .

1.2.2 Writing System

A simple disposable felt-tip pen system is the heart of the writing system for the 305X. It consists of an easily replaceable porous fiber writing tip with integral ink reservoir. The pen itself provides a fine-line trace of 0.5 mm (0.020 in.) thickness for precise recording. It is available in four color choices and provides over 1000 m (3300 ft.) of high quality, skip-free traces at writing speeds of more than 120 cm/s. Local and remote penlifts are standard.

1.2.3 Drive System

The DC servo pen drive system has one of the highest speed and acceleration capabilities in laboratory or general-purpose recorders today, permitting accurate tracking of even fast-changing signals. This fast response is a real plus for transient signal analysis and destructive test applications often encountered in R & D and QC lab environments, while further assuring the accuracy needed for general-purpose work. Slewing speed is 85 cm/s minimum, Y-axis acceleration is 7700 cm/s^2, and X-axis acceleration is 5100 cm/s^2.

The reliability and long life of the DC servo system is assured by advanced built-in electronic protection. Electronic signal limiters, adjustable for either large or small standard chart sizes, protect the recorder from off-scale input signals and eliminate mechanical wear associated with alternate mechanical slip-clutch approaches. In addition, the risk of drive-motor burnout resulting from physical blocking of the carriage is greatly reduced by protective circuitry that lowers current levels to the motor during overload conditions. Reliability as well as resolution is further enhanced by the use of conductive-plastic potentiometers that never need lubrication. The STANDBY feature may be either locally or remotely controlled.

1.2.4 X and Y Preamplifiers

To accommodate a wide range of input signal amplitudes, each of the functionally identical X- and Y-axis preamplifiers provide 14 push-button selected sensitivities from 200 micro-volts/cm to 5 volts/cm*. English units are also available.

Other features include floating and guarded inputs at front and rear for recording from both grounded and ungrounded sources, an input polarity reversal switch and a high input impedance of 1 megohm at all signal levels to avoid loading input sources. In addition, ease of in-service adjustment of internal components is assured by the unit's fold-down front and easily removable preamplifiers.

The X- and Y-axis preamps for the Gould 3054 and 3056 include a feature not usually found in instruments of their price class: calibrated zero offset. The 3054 has five pushbutton-selected steps from ±100% to ±500% of full scale. The 3056 has ten steps from ±100% to ±1000%. Calibrated zero offset allows the user to suppress the static portion of an input signal so that its dynamic portion can be amplified a maximum amount for detailed examination.

Standard in all 305X models is a pushbutton-selected low-pass filter providing 12dB per octave attenuation starting at 6Hz. The low-pass filter enables the user to exclude unwanted noise or high-frequency components from the preamp outputs so that the recorded trace will contain a maximum amount of meaningful information with a minimum of extraneous interference.

* The model 3056 has 18 sensitivities from 10 micro volts/cm to 5 volts/cm.

TABLE 1-1 MODEL NUMBER DESCRIPTIONS

RECORDER	MODEL NUMBER	DESCRIPTION	
3052	15-3307-02	English units.	
3052	15-3307-08	Metric units.	
3052	15-3307-12	English. With Time Base.	
3052	15-3307-18	Metric. With Time Base.	
3054	15-3307-00	English	All 3054's have calibrated zero offset up to ±500%.
3054	15-3307-06	Metric	
3054	15-3307-10	English. With Time Base.	
3054	15-3307-16	Metric. With Time Base.	
3056	15-3307-01	English.	All 3056's have calibrated zero offset up to ±1000% and high gain preamps.
3056	15-3307-07	Metric.	
3056	15-3307-11	English. With Time Base.	
3056	15-3307-17	Metric. With Time Base.	

1.3 SPECIFICATIONS

Slewing Speed . . . . . 3054 & 3056: 85 cm/s (33 in./s) minimum, 100 + cm/s (40 + in./s) typical.
3052: 60cm/s (23 in./s) minimum.

Acceleration . . . . . .3054 & 3056: Y-Axis - 7700 cm/s^2 (3030 in./s^2), X-Axis - 5100 cm/s^2 (2010 in./s^2).
3052: Y-Axis - 3800 cm/s^2 (1500 in./s^2).
X-Axis - 2100 cm/s^2 (830 in./s^2).

Non-Linearity . . . . . ±0.15 F.S.D. (includes feedback element and amplifier non-linearity).

Deadband . . . . . 0.1% F.S.D.

Overshoot . . . . . .1% F.S.D.

Types of Input . . . . . Floating and guarded. 5-way binding posts on front panel, high level (±2.5VFS) input on rear.

Input Range . . . . . 3052 & 3054 Metric: Effective ranges of 0.2, 0.5, 1.0, 2, 5, 10, 20, 50 mV/cm; 0.1, 0.2, 0.5, 1.0, 2, 5 V/cm.

3056 Metric: Same as above plus 0.01, 0.02, 0.05 and 0.1 mV/cm.

3052 & 3054 English: Effective ranges of 0.5, 1.0, 2.5, 5, 10, 25, 50, 100 mV/in., 0.25, 0.5, 1.0 2.5, 5, 10 V/in.

3056 English: Same as above plus 0.025, 0.05, 0.1 and 0.25 mV/in.

Pushbutton selectable with continuous vernier between ranges.

Maximum Input Voltage . . 500 VDC (3052 & 3054), 250 VDC (3056), continuous input at all sensitivities.

Overrange Protection. . . . . Electronic limiters at chart edge, selectable for 11 x 17-in. (DIN A3) or 8½ x 11-in. (DIN A4) chart sizes, plus drive motor over-current protection.

Input Impedance. . . . . .1 megohm on all sensitivities.

Common Mode Voltage. . . . . .500 VDC, peak AC (X, Y, chassis isolated).

Common Mode Rejection . . . . 140 dB DC, 120dB AC at 60Hz (with 1 kilohm between high and low inputs and low connected to ground) on 3054 & 3056. For 3052, specs are 130 and 110, respectively.

Input Filter . . . . . Switchable, 12 dB/octave attenuation, -3dB at 5Hz.

Attenuator Range Inaccuracy . . . . . ±0.15% full scale.

Calibration Inaccuracy . . . . . ±0.1% full scale.

Gain Temperature Coefficient . . . . . 3052 & 3054: ±0.01% full scale/°C; 3056: ±0.02% full scale/°C.

Zero Temperature Coefficient . . . . . 3052 & 3054: ±0.03% full scale /°C.
3056: ±0.01% F.S./°C except 0.03% F.S. on 25μV/in. (10μV/cm) range.

Zero Offset (Not on 3052 models) . . . . . 3054: ±500% F.S.D., calibrated in 5 steps of ±100% full scale.
3056: ±1000% F.S.D. calibrated in 10 steps of ±100% F.S. Pushbutton selected.

Pen/Zero Position . . . . . Anywhere on writing surface with coarse and vernier control.

Offset Inaccuracy (N/A on 3052) . . . . . ±0.15% full scale multiplied by number of steps of 100% offset.

Offset Temperature Coefficient (N/A on 3052) . . . . . ±0.01% full scale/°C
multiplied by number of steps of 100% offset.

Zero Check . . . . . Provided when attenuator in OFF position.

Time Base . . . . . Optional, with sweep speeds of 0.25, 0.5, 2.5, 5, 25, 50 s/cm
(0.5, 1.0, 5, 10, 50, 100 s/in. Pushbutton selected, switchable to X- or Y-axis.
Reset, auto reset, and end-of-scan controls provided.
Remote control of start and reset provided.

Time Base Inaccuracy . . . . . ±1% full scale.

Time Base Non-Linearity . . . . . ±0.5% full scale.

Time Base Temperature Coefficient . . . . . ±0.1% full scale/°C.

Chart Size . . . . . 17 x 11 in. (DIN A3) maximum.

Writing Area . . . . . 38 x 25 cm (15 x 10 in.).

Chart Hold-Down . . . . . Electrostatic.

Chart Alignment . . . . . High intensity target lights (6) for both large and
small standard chart formats. Carriage release switch provided.

Writing Method . . . . . Disposable long-life fiber-tip pen, 0.5 mm (0.020 in.) line width.

Pen Lift . . . . . Electrical, local or remote (contact closure or TTL).

Dimensions . . . . . 48.3 cm (19 in.) wide; 16.5 cm (6.5 in.) high;
48.8 cm (19.22 in.) deep. Integral rack mounting.

Weight . . . . . 3054 and 3056: 16 kg (36 lb.) 3052: 15 kg (33 lb.).

Power Requirements . . . . . 100, 120, 220, 240 VAC ±10%, 50 to 400 Hz.

Environment . . . . . Operating temperature 0 to 55°C.
Storage temperature -40 to 70°C.
Maximum humidity 95% at 32°C,
except 85% on 3056.

Remote Control . . . . . Timebase Start and Reset, Pen Down, Operate/Standby.

1.4 SUPPLIES AND ACCESSORIES

The following table lists available supplies and accessories which may be ordered as required by contacting your local Gould representative.

Description	Part Number
ACCUCHART ® paper (High-Contrast Gloss)(100 sheets)	
English ruled 10 x 15 inches, 0.1" Div., 1" squares	11-2913-37
Metric ruled 26 x 38 cm, 1mm Div., 1 cm squares	11-2913-38
Unruled	11-2913-39
ACCUCHART ® paper (100 sheets) (Uncoated)	
English ruled 10 x 15 inches, 0.1" Div., 1" squares	11-2913-34
Metric ruled 26 x 38 cm, 1mm Div., 1 cm squares	11-2913-35
Unruled	11-2913-36
PENS (Disposable Fine-Point Fiber-Tip) (Package of Five)	
Black	295220-1
Blue	295220-2
Red	295220-3
Green	295220-4
LAMP, PAPER ALIGNMENT (6V, 200ma, T-1½)	234339
DUST COVER	493698
REMOTE CONTROL CONNECTOR	
Mating Connector (1 Required)	266592-1
Connector Shield (1 Required)	284428-15
REAR INPUT CONNECTORS TO DRIVE AMPS (1 per channel) (¼" phone plug, 3 conductor)	114816-15
RACK MOUNTING HDW:	
Screw, Soc. Hd., 10-32 x 3/4 (4 Required)	20-119922-0212
Nut, 10-32 (4 Required)	245244-02
Washer, Flat (4 Required)	5-118195-309
Wrench, Hex. Soc. 5/32 (1 Required)	245218-10
TIME BASE RETROFIT (-1 English, -2 Metric)	893227-1, -2
FUSE, 1.5 AMP SLO-BLO (For 100 or 120 V Power)	116198-11
FUSE, 3/4 AMP SLO-BLO (For 220 or 240 V Power)	116198-9
POWER CABLE	291067

SECTION II

INSTALLATION

2.1 INTRODUCTION

This section describes the inspection checks to be performed on receipt of the Gould 305X X-Y Recorder. It also details power, environmental, and signal connection requirements.

2.2 INCOMING INSPECTION

Perform the following procedures on receipt of the unit:

a. Remove packing material and tape from the recorder.

b. Visually inspect unit for damage that may have occurred during shipment. Refer to concealed-damage and warranty cards.

c. Remove the clamping bracket used to immobilize the pen carriage. This bracket should be saved in case reshipment is ever required (see paragraph 3.6).

2.3 POWER REQUIREMENTS

The 305X Recorder requires 100 watts of power at either 100, 120, 220, or 240 volts +10%, -20%. The frequency must be between 48 and 440 Hertz. The recorder must be set to select one of the above voltages before connecting the separate power cable. (The units are normally shipped set-up for 120 volts.) See Figure 2-1, REAR CONNECTOR PANEL. This panel is near the back of the unit on the bottom side, and is accessed by slightly raising the back of the recorder. Selection is accomplished by performing the following steps.

a. Slide the clear plastic window to the left (the power cable must be removed).

b. Pull the fuse-removing lever all the way to the left (removing the fuse).

c. Remove the small card just under the fuse (use pliers or a pointed object to assist).

d. Note that this card may be inserted in any one of four ways. The proper way is so that the voltage to be used may be read on the card after it is put in place. That is, the voltage can be read, right side up, on the left side of the top of the card. Insert the card.

e. Move the fuse lever back to the right side.

f. Insert the proper value "SLO-BLO" type fuse, which is 1.5 amp for 100 or 120 volts, or 3/4 amp for 220 or 240 volts.

g. Slide the window back over the fuse.

h. MAKE CERTAIN the POWER pushbutton is in the OFF (full out) position. Depress to release if necessary.

j. Connect the power cable to the recorder and to the power source.

WARNING: TO PREVENT THE POSSIBILITY OF SHOCK HAZARD, ALWAYS BE CERTAIN THE RECORDER POWER CABLE IS CONNECTED TO GROUND.

2.4 ENVIRONMENTAL REQUIREMENTS

The following environmental limitations must be observed when operating or storing the recorder.

Storage Temperature . . . . . -40°C to 70°C.
Operating Temperature . . . . . 0°C to 55°C.
Operation Within Specs . . . . . ±10°C from Temperature at calibration.
Maximum Relative Humidity . . . . . 95% at 32°C, non-condensing, except 85% on 3056.

2.5 SIGNAL AND CONTROL CONNECTIONS

2.5.1 Preamplifier Inputs

The Gould 305X Recorder accepts input signals on both the X and Y axes. Each preamp has three, five way binding post terminals labeled GUARD, LOW and HIGH. These are located on the front panel near the controls (See Figure 2-2, showing the 3054 as exemplary).

The preamps have a high input impedance of 1 megohm at all signal levels, and a 500 V maximum input voltage (250 on 3056) on all sensitivity ranges.

Inputs are floating and guarded for recording from either grounded or ungrounded sources. Please refer carefully to Figure 2-3 and the following rules for guidance in connecting the particular source.

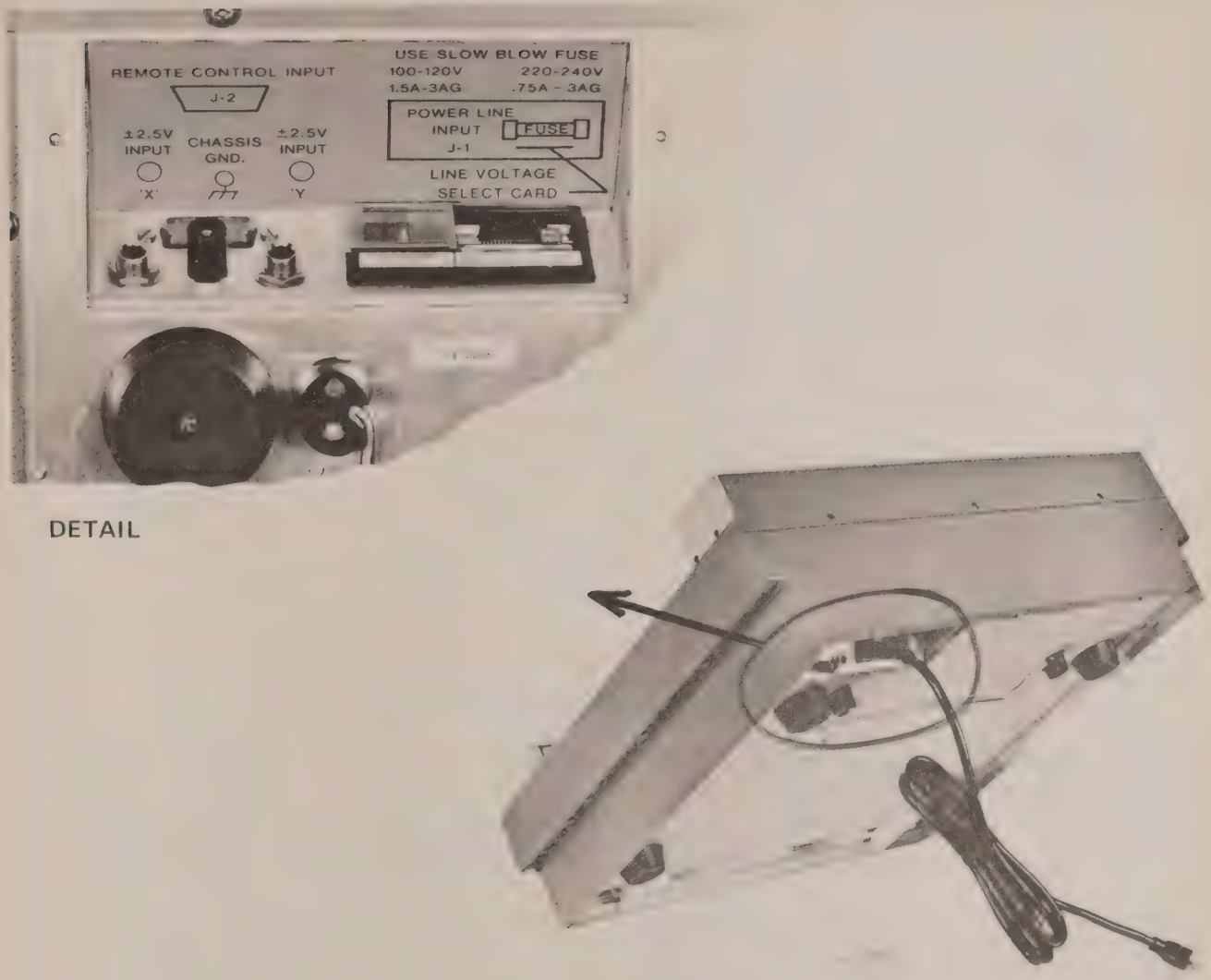


FIGURE 2-1 REAR CONNECTOR PANEL

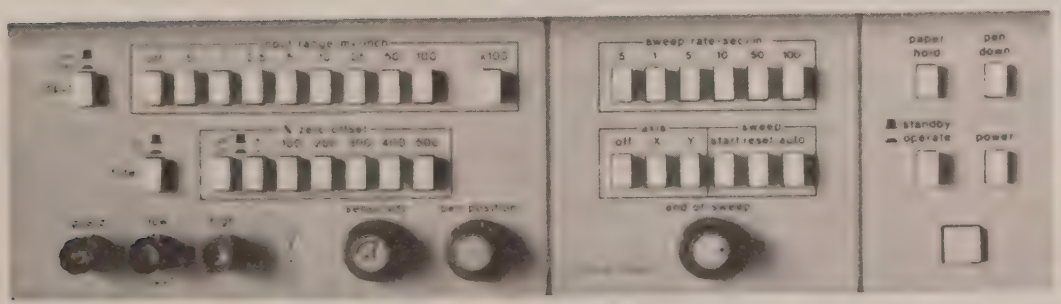


FIGURE 2-2 FRONT PANEL CONTROLS

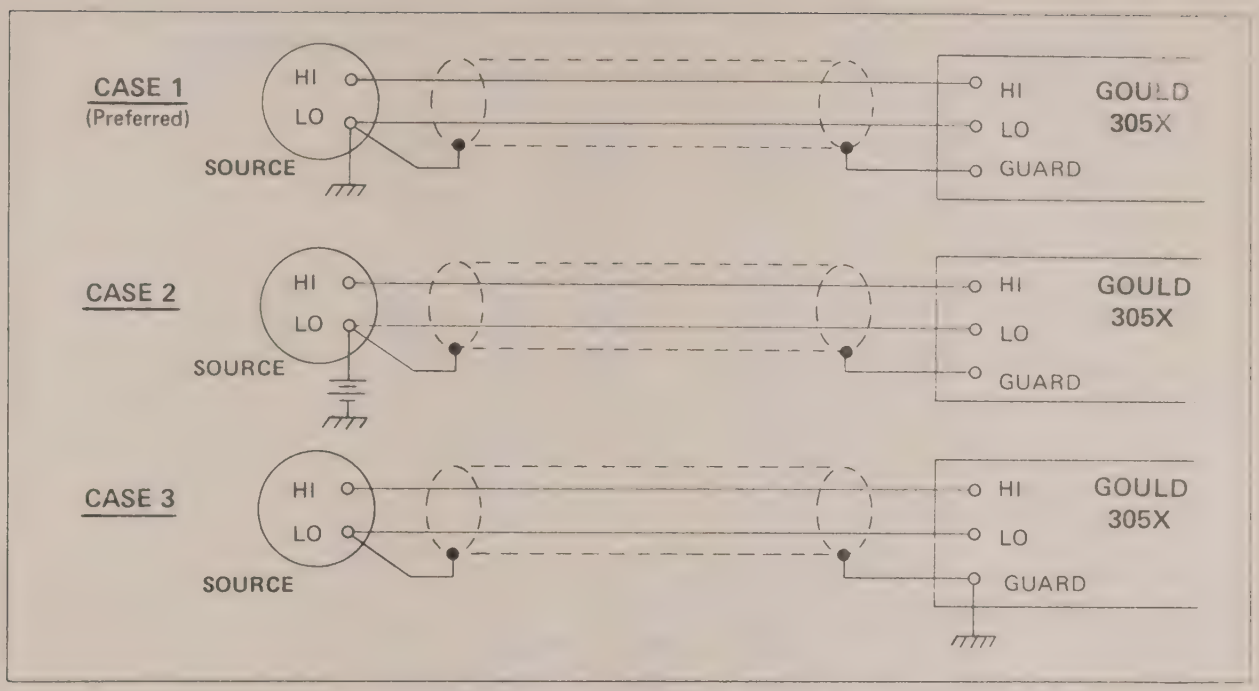


FIGURE 2-3 SIGNAL INPUT CONNECTIONS

Rules for good signal connections to the Gould X-Y Recorder:

1. Use only top quality twisted pair shielded cable*, along with a shielded banana plug such as Pamona #1433, 1921 or 1791.

2. Always connect the shield to the GUARD terminal of the recorder.

3. Always connect the shield to the low terminal at the source.

4. Never connect the system to ground at more than one place.

5. Make the ground connection per the appropriate case listed below.

   Case 1. Preferably the system should be grounded at the source, connecting the junction of the shield and the low terminal to ground.

   Case 2. If the source is operating at some fixed potential other than ground, make no ground connection.

   Case 3. If it is not physically possible to ground the source, ground the GUARD terminal of the recorder. (Earth ground is available at the CHASSIS Terminal on the Rear Connector Panel, Fig. 2-1.)

2.5.2 Rear Signal Inputs

Connectors are provided on the rear panel (See Figure 2-1) for directly driving the X and Y drive amplifiers with a high level input (±2.5 volts full scale. Inserting a 3- conductor ¼" phone plug into one of these connectors disconnects the preamp output from the drive amp input and instead connects the phone plug to the drive amp. The tip is the signal high, the ring is the low, and the sleeve (shell) is a guard or shield connection. None of the three is connected to earth ground.

WARNING: USE PLUG WITH INSULATED HANDLE. THE GUARD CIRCUIT MAY BE ABOVE GROUND.

2.5.3 Control Inputs

Figure 2-4, REMOTE CONTROL CONNECTOR, shows how to wire the remote control of pen lift and remote/standby, which may be either a TTL signal or contact closure, and also the remote time base reset and start inputs, which may be either a TTL signal or a contact closure.

* For best results using the more sensitive ranges of the model 3056, this input cable should, in addition, be solid copper, with all oxidation removed where making connections.

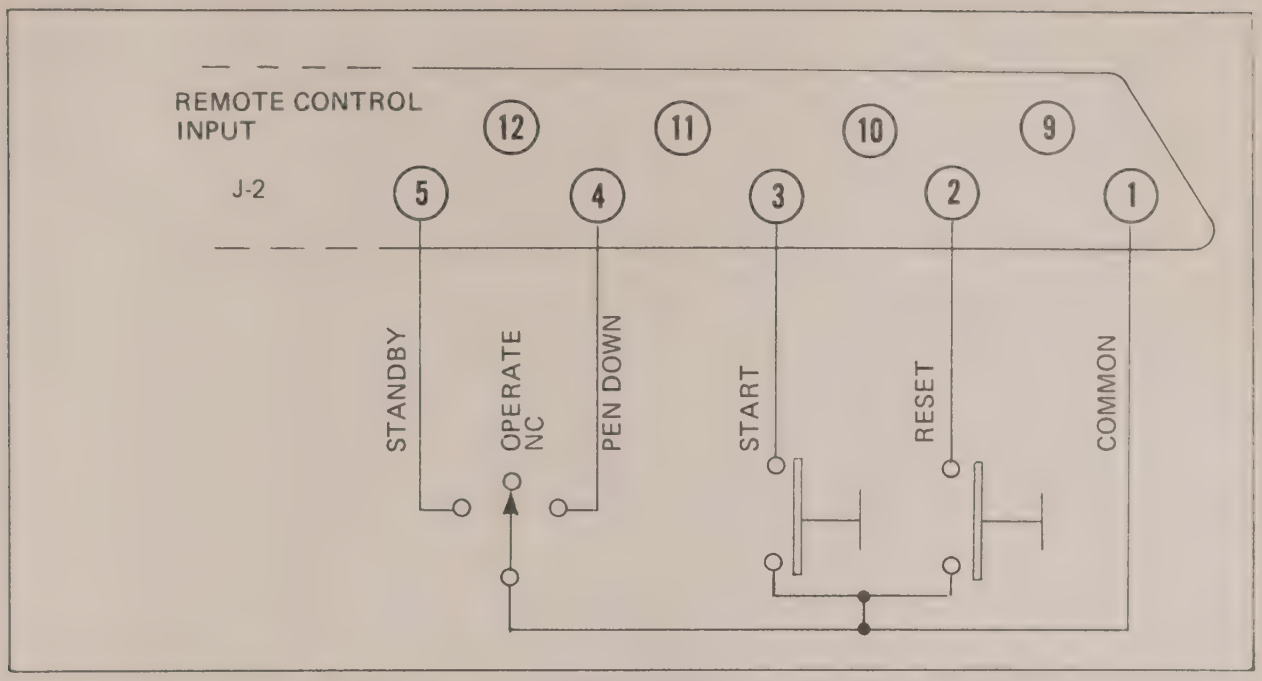


FIGURE 2-4 REMOTE CONTROL CONNECTOR

2.6 19" STANDARD RACK MOUNTING

The 305X X-Y Recorder may be mounted vertically in a standard 19" rack without any modification. All that is required is the mounting hardware listed below, which is supplied with every recorder.

Hardware Required for Rack Mounting

Description	Quan.	Gould P/N
Screw, Soc.Hd., #10-32x¾	4	20-119922-0212
Nut, #10-32, "Floating"	4	245244-02
Washer, Flat	4	1-118195-309
Wrench, Hex. Soc. 5/32	1	245218-10

Before placing the recorder in position, locate the Tinnerman floating nuts on the mounting rack as shown in Figure 2-5 below.

Remove the two trim strips which clamp down the left and right edges of the writing table. Each one is held by two screws. (The writing table will remain held by two additional screws.) The four mounting holes are now visible under the trim strip area. Place a flat washer on one of the screws and place the screw on the Hex wrench. With the recorder placed in the desired vertical position, the Hex wrench may be used to start, as well as tighten the screws. Replace the trim strips after all four screws are installed.

2.7 TIME BASE RETROFIT

The optional Time Base may be added to a 305X Recorder at any time by obtaining a Gould 893227 -1 or -2 Time Base Retrofit. Recorders purchased without the time base are supplied with a "dummy module" in place of the time base. See paragraph 4.4 in the MAINTENANCE section for instructions on opening the front panel.

To add a Time Base, loosen the two screws behind the enclosure and slide the white bar back, allowing the blank panel and enclosure to be removed and replaced by the Time Base. Slide the white bar/tab forward to engage the enclosure and retighten the two screws. Plug the circuit board, which is attached to the Time Base module with a flexible cable, into the slot provided for it.

2.8 RESHIPMENT PREPARATIONS

Before shipping the Gould 305X Recorder, replace the protective cap on the pen tip. The pen carriage must be secured to prevent damage. The best way to do this is by using the clamping bracket (No. 694281) supplied with the unit to keep the pen in one corner. Package the recorder carefully.

2.9 OUTLINE DIMENSIONS

Refer to Figure 2-6 for outline dimensions.

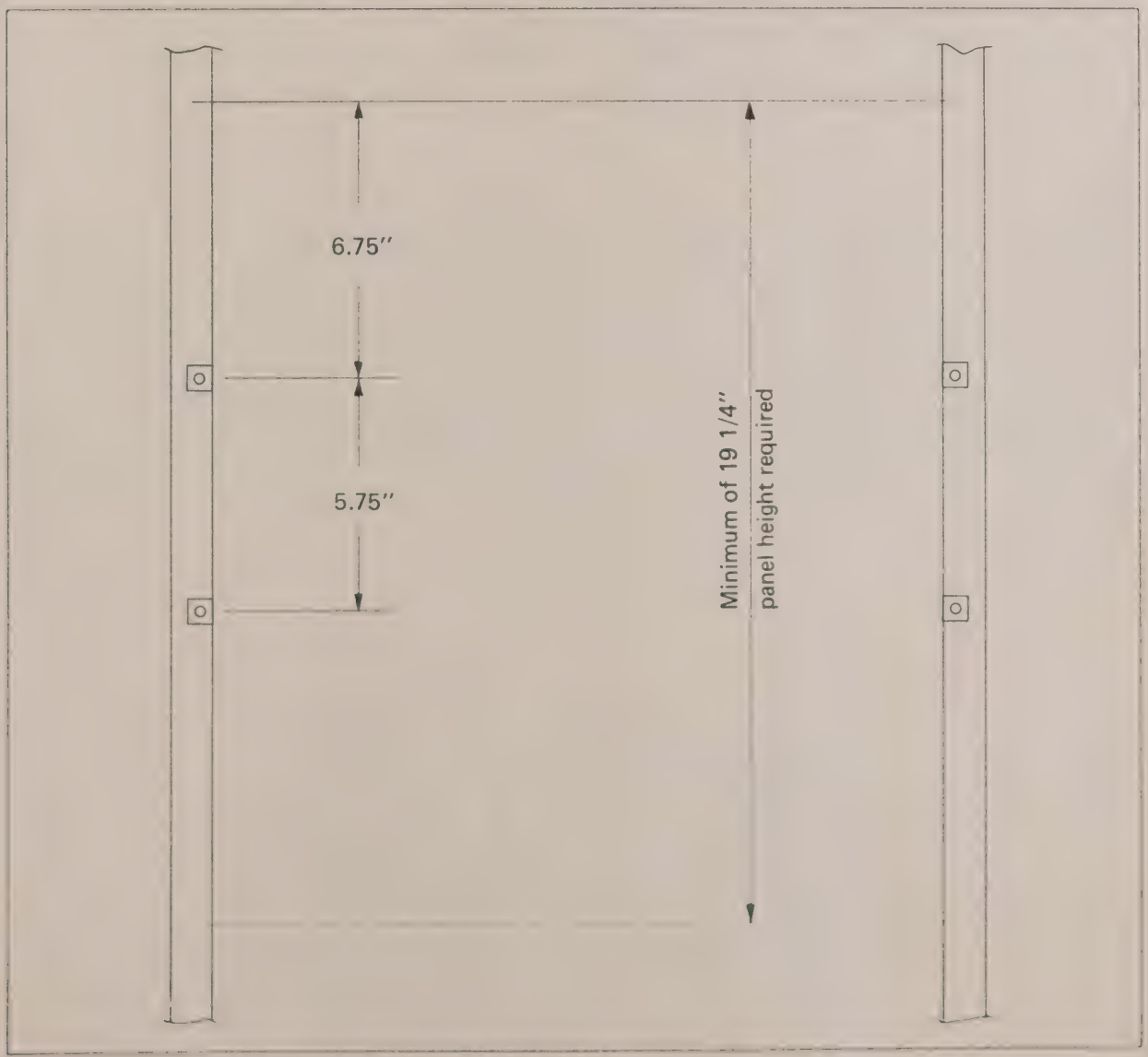


FIGURE 2-5 RACK MOUNTING

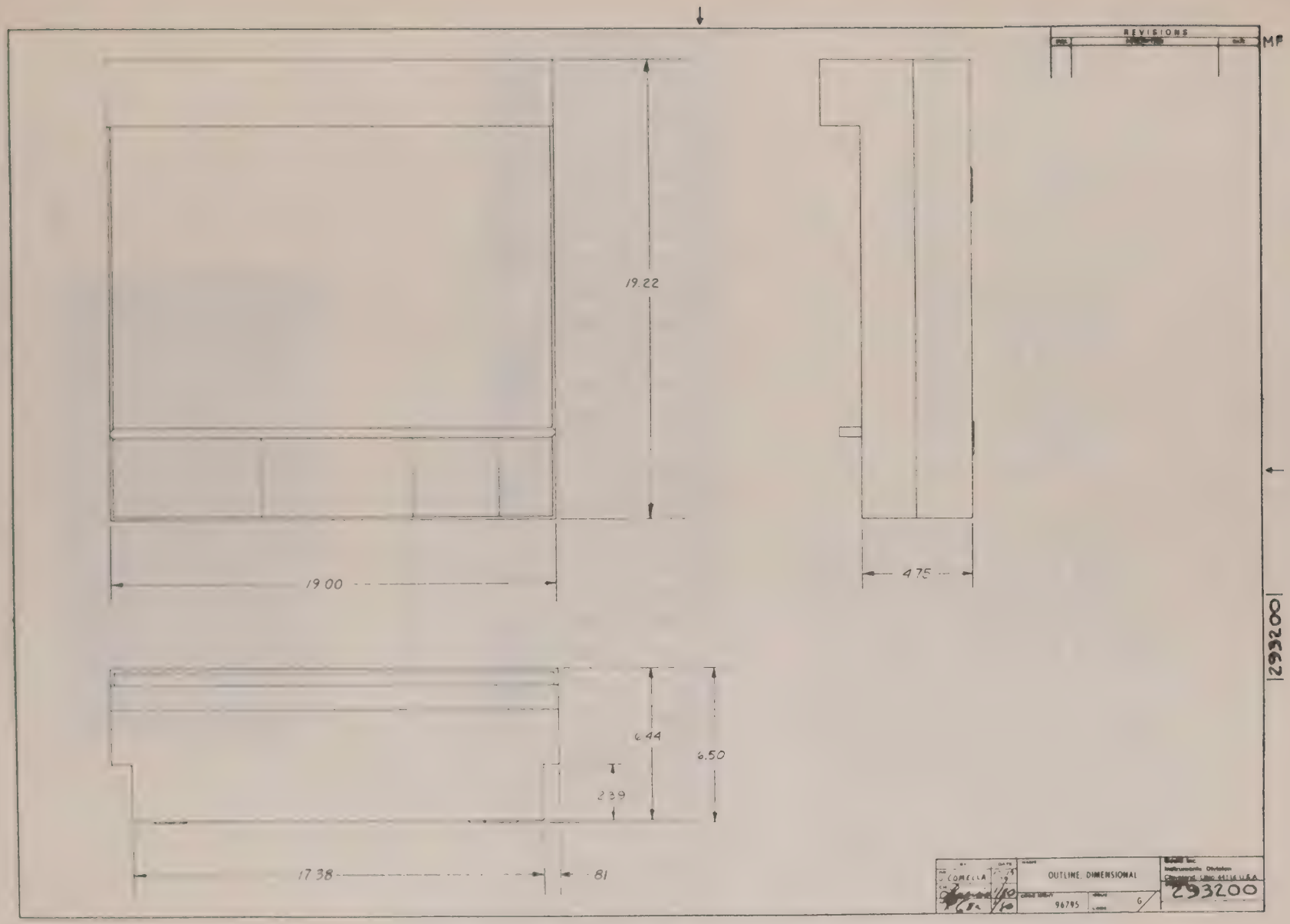


FIGURE 2-6 OUTLINE DIMENSIONS

SECTION III

OPERATION

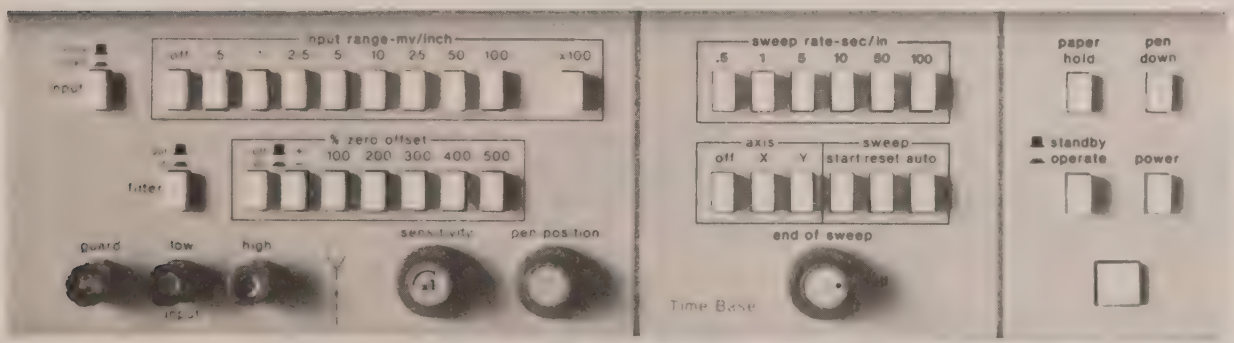
3.1 INTRODUCTION

This section gives a complete description of operator controls and indicators and their functions. Power-on and power-off procedures are also given. Operator maintenance instructions, including pen and paper replacement details, are given in Section IV, MAINTENANCE.

CAUTION: SEE THE CLEANING SECTION OF SECTION IV BEFORE ATTEMPTING ANY CLEANING PROCEDURES.

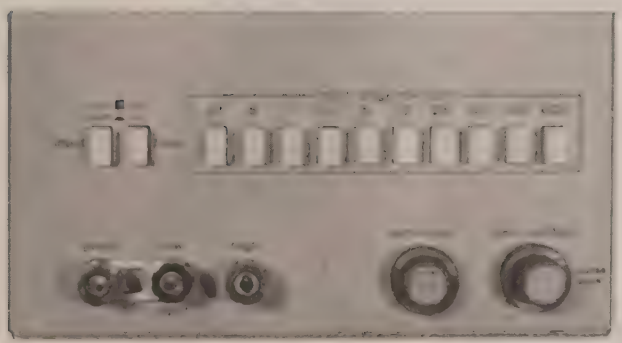
3.2 CONTROLS AND INDICATORS

The front panel controls and indicators are shown in Figure 3-1. Table 3-1 gives a summary of the action of each control, and the status provided by each indicator. The controls are listed in groups by function as they appear on the panel: the basic recorder functions (e.g. power), the preamplifiers (the X-axis and Y-axis controls are identical), and the optional timebase module. Also described are the rear connector panel terminals and any internal operator controls (see Section IV, MAINTENANCE, for instructions on reaching the internal controls). NOTE: Model 3056 front panel is similar to the 3054 shown, except the preamp has additional RANGE and ZERO OFFSET push-buttons. See specifications.



bi 2209

FIGURE 3-1A 3054 CONTROL PANEL



bi 2280

FIGURE 3-1B 3052 PREAMP CONTROL PANEL

TABLE 3-1 CONTROLS AND INDICATORS

GROUP	NAME	DESCRIPTION	FUNCTION
BASIC	POWER	Push On/Push Off.	Applies line power to unit.
	None	Indicator only. White.	Indicates line power is on.
	STANDBY/ OPERATE	Push On/Push Off.	When depressed, this alternate-action switch allows normal operation. When released (full out position) power is removed from both servo motors to place the recorder in standby.
	PAPER HOLD	Push On/Push Off.	When this switch is depressed, the electrostatic paper hold-down circuit is energized to hold paper.
	PEN DOWN	Push On/Push Off.	With this button depressed, the pen solenoid is energized and the pen is dropped on to the chart paper to permit writing.
PRE-AMPLIFIER (X-axis or Y-axis)	INPUT Terminals	5 way binding post.	3 binding posts provide for convenient signal inputs to each axis of the X-Y Recorder.
	PEN POSITION (coarse push)	Dual rotary control on one, locking knob (turn for vernier, push and turn for coarse).	Uncalibrated, single knob coarse/ vernier rotary control to position pen. The coarse range (with knob pushed in) has a range of ±60% F.S. The vernier range is ±4% F.S.
	INPUT NORM/INVERT	Push On/Push Off.	This alternate action pushbutton switch reverses this signal polarity when depressed. With normal polarity, positive input causes the pen to move from left to right (X channel) and bottom to top (Y channel).
	INPUT RANGE -MV/CM (or MV/INCH)	3052 and 3054: 8 interlocking "Range" pushbuttons, 1 Push On/Push Off "OFF" Switch, 1 Push On/ Push Off "X100" Switch.	**Metric Model** — Eight interlocking pushbutton selectable steps of .2, .5, 1.0, 2.0, 5.0, 10.0, 20.0, 5 0 .OMV/CM and X100 for total of 14 steps with range of .2MV/CM to 5V/CM. **English Model** — Eight interlocking pushbutton selectable steps of .5, 1.0, 2.5, 5.0, 10.0, 25.0, 50.0, 100 MV/IN. and X100 for total of 14 steps with range of .5MV/in. to 10V/in.

TABLE 3-1 CONTROLS AND INDICATORS (Cont'd)

GROUP	NAME	DESCRIPTION	FUNCTION
PRE-AMPLIFIER (X-axis or Y-axis) (Cont'd)	INPUT RANGE -MV/CM (or MV/ INCH) (Cont'd)	3056: Nine interlocking "Range" pushbuttons, one Push On/Push Off "OFF" Switch, one Push On/Push Off "x1000" Switch.	Metric Model - Nine interlocking pushbutton selectable steps of 0.01, 0.02, 0.05, 0.1, 0.2, 0.5, 1, 2, 5 mV/cm and x1000 for a total of 18 steps with range of 0.01 mV/cm to 5V/cm. English Model - Nine interlocking pushbutton selectable steps of 0.025, 0.05, 0.1, 0.25, 0.5, 1, 2.5, 5.0, 10.0 mV/in. and x1000 for a total of 18 steps with a range of 0.025 mV/in. to 10V/in.

TABLE 3-1 CONTROLS AND INDICATORS (Cont'd)

GROUP	NAME	DESCRIPTION	FUNCTION
PRE-AMPLIFIER (X-axis or Y-axis) (Cont'd)	INPUT RANGE -MV/CM (or MV/INCH) (Cont'd)		OFF pushbutton, non-interlocking, serves as a pen zero or zero check feature by removing the signal and offset voltages, and grounding the preamp input. X100 or X1000 pushbutton, when depressed, multiplies the selected INPUT RANGE setting by 100 or 1000. (Non-interlocking).
	SENSITIVITY	Rotary control and locking knob. Has full clockwise detent X1 position.	Provides intermediate sensitivities between the 14 fixed, pushbutton-selected INPUT RANGE settings. When in the full clockwise X1 (detent) position, the preamplifier sensitivity is fixed as indicated by the INPUT RANGE pushbuttons. In the full counterclockwise position, the signal is attenuated to approximately 40% of the selected range.
	FILTER OUT/IN	Push On/Push Off.	With this button depressed, a low-pass input filter is switched in. This filter provides 12 dB/octave attenuation, starting at 5 Hz, enabling the user to exclude unwanted noise or high-frequency components from the preamp outputs.
	% ZERO OFFSET (Not on 3052 models)	5 (on the 3054) or 10 (on the 3056) interlocking pushbuttons, 1 Push On/Push Off pushbutton, 1 Push On/Push Off polarity pushbutton.	The calibrated, interlocking pushbuttons select offsets of ±100, 200, 300, 400 and 500% of full scale on the 3054, plus 600, 700, 800, 900 and 1000% of full scale on the 3056. The offset ON/OFF pushbutton switch is not interlocking; neither is the offset polarity selector switch (+ / -).
TIME BASE (optional)	SWEEP RATE —SEC/CM (or SEC/IN)	6 interlocking pushbuttons.	Six pushbutton selectable speeds of .25, .5, 2.5, 5, 25, 50 sec/cm or .5, 1, 5, 10, 50, 100 sec/in.

TABLE 3-1 CONTROLS AND INDICATORS (Cont'd)

GROUP	NAME	DESCRIPTION	FUNCTION
TIME BASE (Optional Cont'd)	AXIS	3 interlocking push-buttons: OFF, X, and Y.	When the OFF pushbutton is depressed (cancelling the X and Y buttons) the time base is not connected to the recorder and both the X and Y preamps function as described previously. When the X or Y pushbutton is depressed, the time base (rather than the preamp) is connected to the input of the selected drive amp. All pre-amp panel controls on the selected axis become inoperative except for the PEN POSITION control.
	SWEEP-START	Momentary push-button.	When the START button is depressed, the pen is lowered and starts scanning from zero position to chart edge. If the X axis is selected, scanning is from left to right. Y axis scans from bottom to top. When the chart edge is reached (see END OF SWEEP control below), the pen is lifted. If the AUTO pushbutton was depressed the pen is automatically returned to zero. It remains at zero in the up position until the START button is depressed again. **NOTE 1: The PEN DOWN pushbutton and the remote pen down input have absolute control when calling for pen down. Therefore, for the Time Base end-of-sweep pen lift to function, the PEN DOWN pushbutton must be in the released (full out) position and there should be no remote input for pen down.** **NOTE 2: START may also be remotely controlled by a TTL level input or a contact closure to the rear connector. See Section II, INSTALLATION.**
	SWEEP-RESET	Momentary pushbutton.	This pushbutton is used to return the pen to zero after a scan, if not in the AUTO mode. It may also be used to interrupt a scan. If the RESET button is depressed during scan, the pen is immediately lifted and returned to zero. **NOTE 3: RESET may also be remotely controlled by a contact closure or a TTL level input to the rear connector. See Section II, INSTALLATION.**

TABLE 3-1 CONTROLS AND INDICATORS (Cont'd)

GROUP	NAME	DESCRIPTION	FUNCTION
TIME BASE (Optional Cont'd)	SWEEP-AUTO	Push On/Push Off.	When this button is depressed, the pen will be lifted and returned to zero automatically after a scan is completed. When this button is not depressed, the pen is lifted but does not return to zero(See Note 1.)
	END OF SWEEP	Rotary control and locking knob. Has full clockwise detent ("FULL")	With control in detent position, pen stops and lifts in right or upper margin. Rotating control CCW causes pen scan to terminate and pen to be lifted before reaching margins. Range of control is approximately 80% of full scale.
REAR CONNECTOR PANEL	POWER LINE INPUT J-1	Combination power cord connector, line voltage selector, and fuse.	See Section II, INSTALLATION.
	X and Y	2, 3-conductor ¼" phone plug receptacles.	High level input to X and Y drive amplifiers.
	CHASSIS ⏚	5 way binding post	Ground connection.
	REMOTE INPUT J-2	Signal D Connector	TTL or contact closures input for control of pen lift, standby/operate, and also for start and reset of time base. See Section II, INSTALLATION.
INTERNAL OPERATOR CONTROLS	LIM SIZE L-S	2 Toggle switches, accessible upon opening the front panel (See Section IV, MAINTENANCE).	One toggle switch is located on the front edge of each drive amp (the top side, near left edge). These switches select an alternate range for the electronic limiters if 8½ by 11 inch paper is to be used. With the toggle to the right or "S" for Small, the limits are normally set for 7 x 10 inches. "L", for Large paper, results in 10 x 15 inch limits, for 11 x 17 inch sheets. (These limits are adjustable. Please see the GOULD X-Y RECORDER SERVICE MANUAL No. 15-803307-XXS, or contact your local Gould representative.

3.3 OPERATING INSTRUCTIONS

3.3.1 Power On and Preliminary Operation

CAUTION: TO PROTECT THE WRITING SURFACE OF THE RECORDER FROM NICKS AND SCRATCHES, ALWAYS KEEP A SHEET OF GOULD CHART PAPER OVER THE WRITING SURFACE.

When preparing the Gould 305X X-Y Recorder for operation, carefully observe all of the following steps:

a. Be certain that all required steps in Section II, INSTALLATION, have been performed.

b. Before applying power, set the following front panel controls as instructed: The POWER, PEN DOWN, PAPER HOLD, STANDBY/OPERATE, and PREAMP-INPUT, FILTER and % ZERO OFFSET OFF/ON* should all be in the released or full out position. Depress to release if necessary. The TIME BASE AXIS OFF and the PREAMP INPUT RANGE OFF should both be in the OFF or depressed position.

c. Depress the POWER button. Observe that the white power on indicator is illuminated.

d. If the pen tip is touching the writing surface, release the PEN DOWN pushbutton. This action raises the pen from the paper.

e. Move the carriage all the way to one side to facilitate paper replacement.

CAUTION: BEFORE MOVING PEN MANUALLY, MAKE CERTAIN THE STANDBY/OPERATE SWITCH IS IN STANDBY (RELEASED, FULL OUT POSITION). ALSO, THE CARRIAGE MUST ALWAYS BE GRASPED NEAR THE UPPER END WHEN MOVING IT BY HAND.

f. Carefully insert a sheet of chart paper under the pen carriage assembly. Align chart using the six optical fiber illuminated target lights. There are four on the X-axis centerline at 0, 26, 75, and 98% of full scale (15"). There are two, above and below the centerline for locating left edge of 8½ x 11" sheet. See Table 3-1, INTERNAL OPERATOR CONTROLS.

g. Depress CHART HOLD button.

h. Remove wrinkles and bubbles from chart paper with light sweeping motion of the finger tips.

NOTE: It is extremely important to remove all wrinkles and bubbles. Otherwise, pen tip will not write properly.

i. Remove the protective cap from the pen tip; store for use after recorder operation.

j. Release PEN DOWN pushbutton.

k. Depress the STANDBY/OPERATE pushbutton.

WARNING: KEEP HANDS AND FINGERS OUT OF THE RECORDING AREA WHENEVER THE UNIT IS IN THE "OPERATE MODE. WHEN THE "STANDBY/OPERATE" BUTTON IS DEPRESSED THE PEN CARRIAGE WILL BE IMMEDIATELY DISPLACED TO THE LAST SETTING OF THE POSITION CONTROL.

l. Use PEN POSITION controls to place pen anywhere on the paper.

m. Connect signal inputs. If accidentally overvoltaged in the x1 mode, allow time for the preamp to cool.

n. Set the % ZERO OFFSET*, INPUT RANGE, and SENSITIVITY controls to a position that will properly display input signal. (See Table 3-1 for use of controls.)

o. Unit is ready for operation, if both X and Y signals are from external sources. (See Section 3.3.2 for TIME BASE use.) To record, depress the PEN DOWN Pushbutton.

3.3.2 Time Base Operation

The optional time base module is switchable to either axis to produce X versus time or Y versus time plots. When the desired AXIS is selected and the SWEEP is initiated by depressing the START pushbutton, the time base supplies a "ramp" voltage to the selected drive amp. The only preamp control on the chosen axis that remains functional is the PEN POSITION control.

The operating procedure using the time base is similar to that described in the previous Power On and Preliminary Operation section except for the following:

1. No signal inputs need be connected to the preamp of the axis to be used for time. Instead, simply depress either the X or Y Axis pushbutton.

* The % ZERO OFFSET OFF/ON switch in the 3056 is reversed and should be in. This switch is not on 3052 models.

2. Make certain the pen is positioned as desired, using the PEN POSITION controls on each preamp module.

3. Consult the description of the SWEEP controls in Table 3-1 and select either AUTO or non-automatic sweep reset.

4. Select the desired SWEEP RATE.

5. Set the END OF SWEEP control (See Table 3-1). Control should probably not be in the detent (full clockwise) position if the paper being used is smaller than 11 x 17 inches.

6. When unit is ready for operation, depress the STANDBY/OPERATE pushbutton and the SWEEP-START pushbutton. The PEN DOWN pushbutton must be up.

3.3.3 Power-Off Procedure

CAUTION: BE SURE TO FOLLOW THESE STEPS IN SEQUENCE TO AVOID DAMAGE TO PEN.

a. Release PEN DOWN and STANDBY/OPERATE pushbuttons.

b. Depress INPUT RANGE - OFF and AXIS-OFF pushbuttons.

c. Release CHART HOLD pushbutton.

d. Release POWER pushbutton. (Slight movement of the carriage is normal.)

e. Replace the protective cap on the pen tip.

CAUTION: IT IS STRONGLY RECOMMENDED THAT THE DUST COVER (GOULD PART NUMBER 493698) BE PLACED ON THE RECORDER WHEN NOT IN USE.

3.3.4 Remote Control Operation

REAR SIGNAL INPUTS

High level input signals may be connected to the rear panel input connectors as described in Para. 2.5. These are 3- conductor ¼" phone plugs. The input required is ±2.5 V full scale. Using the pen position controls, full scale may be set for any 5 volt span between -5 and +5 volts.

REMOTE PEN DOWN

The Remote Pen Down function is operated as follows (pin 1 is common) (see Fig. 2-4):

a. Switch or relay closure (J2 pin 1 to pin 4).

b. TTL voltage level (J2 pin 1 to pin 4).

OPERATION: The front panel PEN DOWN pushbutton must be UP for the remote control to function. With no remote signal applied or switch open, pen will be up. With "low" remote signal applied or switch closed, pen will be down. Depressing the PEN DOWN pushbutton overrides the remote control, and lowers the pen, as in normal operation.

REMOTE STANDBY/OPERATE

This function is operated as follows (pin 1 is common):

a. Switch or relay closure (J2 pin 1 to pin 5).

b. TTL voltage level (J2 pin 1 to pin 5).

OPERATION: Depress front panel STANDBY/OPERATE pushbutton. With no signal applied or switch open, unit will be in OPERATE. With "low" signal applied or switch closed, unit will be in STANDBY. Releasing the front panel pushbutton overrides the remote control, and stops OPERATION, as in normal operation.

REMOTE TIME BASE CONTROL

The remote START and remote RESET functions can both be initiated by a momentary contact closure or TTL signal (low). The pins on connector J2 are 1 and 2 for RESET and 1 and 3 for START. Pin 1 is common.

SECTION IV

MAINTENANCE

4.1 INTRODUCTION

This chapter has sections describing operative maintenance and preventative maintenance. Operative maintenance generally refers to maintaining materials regularly consumed in operation, i.e. paper and ink. Preventative maintenance consists of cleaning, lubrication, and periodic inspection. A section on removing and replacing the major subassemblies is also included.

4.2 OPERATIVE MAINTENANCE

4.2.1 Chart Paper Replacement

NOTE: Electrical power must remain ON during the replacement procedure.

a. Release the PEN DOWN, STANDBY/OPERATE, and PAPER HOLD pushbuttons in that order. Then, depress the TIME BASE AXIS OFF and the PREAMP INPUT RANGE OFF pushbutton.

b. Move the carriage all the way to one side to facilitate paper replacement.

CAUTION: BEFORE MOVING PEN MANUALLY, MAKE CERTAIN THE STANDBY/OPERATE SWITCH IS IN STANDBY (RELEASED, FULL OUT POSITION). ALSO, THE CARRIAGE MUST ALWAYS BE GRASPED NEAR THE UPPER END WHEN MOVING IT BY HAND.

c. Lift the edge of the chart paper and carefully slide it from under the pen carriage assembly.

d. Slide new chart paper under the pen carriage assembly. Align the chart paper using the six optical fibre illuminated target lights. There are four on the X-axis centerline at 0, 26, 75 and 98% of full scale (15"). There are two, above and below the centerline for locating left edge of 8½ x 11" sheet. See Table 3-1, INTERNAL OPERATOR CONTROLS.

e. Depress the CHART HOLD pushbutton.

f. Remove wrinkles and bubbles from the chart paper with a light sweeping motion of the finger tips.

NOTE: All bubbles and wrinkles must be removed from the chart paper. Otherwise, pen tip will not write properly.

g. Operate the Recorder according to Section III.

4.2.2 Felt Tip Pen Replacement

a. Turn off the electrical power to the recorder.

b. While holding the pen holder with the left hand, use the right to slide the old cartridge out of the holder.

c. Similarly, slide the new cartridge in, making certain the end opposite the tip bottoms on the end stop of the holder.

4.2.3 Power Fuse Replacement

The fuse is in the Rear Connector Panel (See Figure 2-1). To replace the fuse, perform the following steps:

a. Make certain the POWER pushbutton is in the OFF (full out) position. Depress to release if necessary.

b. Unplug the power cable.

c. Slide the clear plastic window to the left.

d. Pull the fuse — removing lever all the way to the left to remove the old fuse.

e. Insert the proper value SLO-BLO fuse: 1.5 amp for 100 or 120 volt units, or 3/4 amp for 220 or 240 volt units.

f. Slide the window back over the fuse.

g. Reconnect the power cable to the recorder and to the power source.

4.3 PREVENTIVE MAINTENANCE

4.3.1 Cleaning

WARNING

a. BEFORE ATTEMPTING TO CLEAN THE RECORDER, BE CERTAIN TO POWER-DOWN THE UNIT (SEE PARAGRAPH 3.3.3) AND TURN THE POWER MAIN OFF IF WORKING INSIDE.

b. AVOID USE OF CHEMICAL CLEANING AGENTS WHICH MIGHT DAMAGE PLASTIC OR PRINTED SURFACES. DO NOT USE CHEMICALS WHICH CONTAIN TOLUENE, CELLUSOLVE, ACETONE OR SIMILAR SOLVENTS.

Exterior Surfaces — Clean when necessary as follows: Remove loose dust with a soft cloth or small paint brush. Dirt which remains can be removed with a soft cloth dampened in a mild detergent and water solution. DO NOT USE ABRASIVE CLEANERS.

Interior — See paragraph 4.4 and WARNING note for instructions on opening the front panel.

Dust in the interior should be removed occasionally due to its electrical conductivity under high humidity conditions. Blow off accumulated dust with dry low pressure air. Remove any dirt which remains with a soft paint brush or a soft cloth dampened in a mild detergent and water solution. Use a cotton-tipped applicator for cleaning in narrow spaces and/or printed circuit boards.

The above cleaning instructions also apply to the conductive-plastic potentiometers used as X and Y position sensors. These pots require no lubrication and should not be lubricated. Just clean occasionally as required with a mild liquid dishwashing detergent.

Ink Removal From Writing Table — Ink may also be removed using a soft cloth dampened in a mild detergent and water solution. *CAUTION: USE NO OTHER SOLVENTS OR ABRASIVES ON THE WRITING TABLE. THE USE OF ANYTHING OTHER THAN MILD SOAP AND WATER MAY IMPAIR THE PAPER HOLD-DOWN ABILITY OF THE TABLE.*

4.3.2 Lubrication

All required lubrication has been performed at the factory prior to shipment.

CAUTION: AS STATED ABOVE, THE CONDUCTIVE-PLASTIC POTS USED AS X AND Y POSITION SENSORS SHOULD NOT BE LUBRICATED.

4.3.3 Inspection Checks

The following checks should be performed once a month, or more often if the situation warrants. For trouble-shooting assistance, consult the Service Manual (See paragraph 1.1 of this book) or contact you local Gould representative.

1. Inspect all accessible wiring and cables for any damage or fatigue. Replace or repair any found defective.

2. Inspect all accessible knobs, pushbuttons, switches, controls, lamps, jacks, connectors, etc. Tighten or replace as required.

3. Make certain that all cable connectors and printed circuit cards are securely seated.

4. Inspect visible sections of drive cables for wear and looseness. Also move pen carriage in both X and Y directions by hand and verify smooth operation.

5. Check writing table (platen) alignment by carefully aligning and securing a sheet of ruled chart paper. Then, with no signal to the Y-axis (INPUT RANGE-OFF), cause the X-axis to move full scale (the PEN POSITION control may be used). The line drawn should be parallel to or coincide with a chart paper line.

4.4 OPENING THE FRONT PANEL

To open the front panel and gain access to various internal controls and parts, follow these steps:

a. Raise the front edge of the recorder.

b. Locate the two, large clamps which are located on the bottom near the front edge. See Figure 4-1 OPENING FRONT PANEL.

c. Rotate these clamps about 90 degrees clockwise as viewed from bottom.

d. The control panel will now swing forward and down.

SEE NEXT PAGE!

WARNING

THE METAL ENCLOSURES BEHIND THE PREAMP PANELS ARE NOT NECESSARILY GROUNDED AND MAY BE AT A DANGEROUSLY HIGH POTENTIAL. THESE BOXES ARE THE FLOATING GUARDS FOR THE INPUT CIRCUIT. IF THE SOURCE IS OPERATING OFF-GROUND AT A POTENTIAL (SEE CASE 2, FIGURE 2-3) THESE ENCLOSURES WOULD BE AT THAT POTENTIAL. TURN OFF OR DISCONNECT THE POWER SOURCE, OR COMPLETELY DISCONNECT THE INPUT CABLING BEFORE OPENING THE FRONT PANEL.

4.5 REPLACEMENT OF MAJOR ASSEMBLIES

The only major assemblies accessible to the operator without any disassembly are the preamps, the time base assembly, and the time base logic board.

The part numbers of these assemblies are given in the following table:

Description of Assembly	Gould Part Number	
	English	Metric
X-Axis Preamp (3052)	894923-1	894923-2
Y-Axis Preamp (3052)	894924-1	894924-2
X-Axis Preamp (3054)	893226-1	893226-2
Y-Axis Preamp (3054)	893900-1	893900-2
X-Axis Preamp (3056)	894846-1	894846-2
Y-Axis Preamp (3056)	894847-1	894847-2
Time Base	894176-1	894176-2
Time Base Logic Bd	293872	293872

These assemblies are all accessible upon opening the front panel (see the previous section, 4.4). The preamps and the optional time base are all removed in the same manner: Each has a flexible flat cable attached which is part of the assembly that is being removed. Hence, the first step is to unplug the cable at the recorder end. Then loosen the two screws behind the assembly that hold down the white bar retaining the assembly. Simply slide the bar backwards to disengage the tab and rotate the assembly out of the front retainer groove.

The time base logic board is removed by unplugging it, using the two plastic loops provided. Pull straight forward until disengaged from the grooved slides.

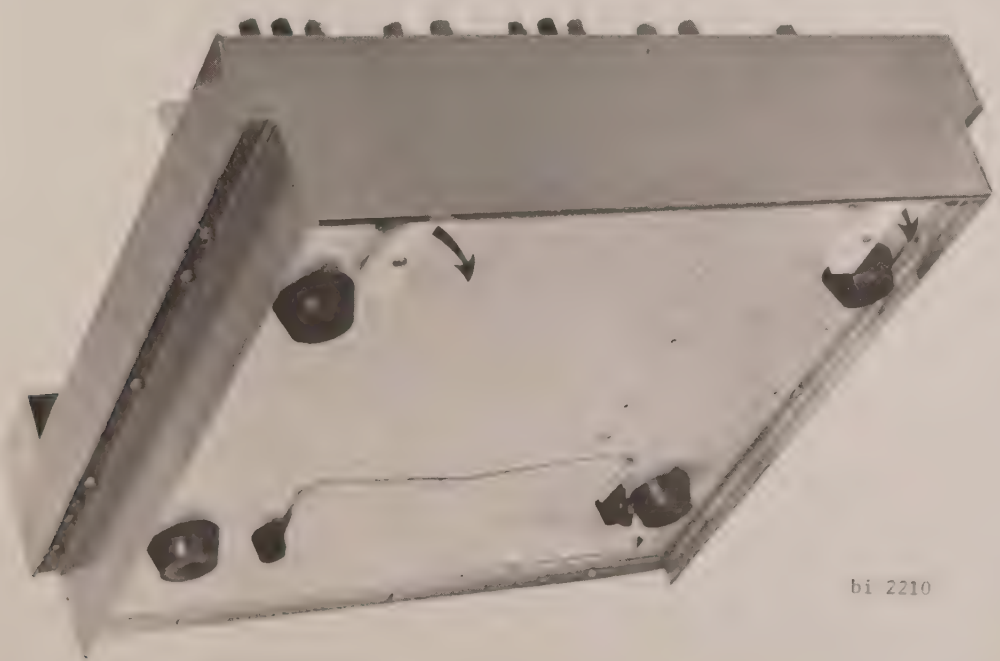


FIGURE 4-1 OPENING FRONT PANEL

NOTE

ALL SCHEMATIC DRAWINGS MAY BE FOUND IN THE APPENDIX AT THE BACK OF THE GOULD 305X X-Y RECORDER SERVICE MANUAL, PART NUMBER 15-803307-XXS.

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